

Guidance for Selection of Wild Steelhead Gene Banks
Draft July 13, 2015

Statewide Steelhead Management Plan

The Statewide Steelhead Management Plan (SSMP) includes the following strategy to conserve and recover wild steelhead:

“Establish a network of wild stock gene banks across the state where wild stocks are largely protected from the effects of hatchery programs. At least one wild stock gene bank will be established for each major population group in each steelhead DPS. Each gene bank will have the following characteristics and management:

- a. Each stock selected for inclusion in the gene bank must be sufficiently abundant and productive to be self-sustaining in the future.*
- b. No releases of hatchery-origin steelhead will occur in streams where spawning of the stock occurs, or in streams used exclusively by that stock for rearing.*
- c. Fisheries can be conducted if wild steelhead management objectives are met as well as any necessary federal ESA determinations.”*

Puget Sound Hatchery Action Advisory Committee

The Washington Department of Fish and Wildlife (Department) created the Puget Sound Hatchery Action Advisory Committee (PSHAAC) in 2011 to help guide the prioritization of hatchery reform actions needed to reduce the risks posed by the state’s hatchery operations in the Puget Sound region. The group was provided with information regarding the status of natural populations of salmon and steelhead as well as the performance and economic benefits of hatchery program throughout the Puget Sound. Based on these data, the PSHAAC suggested watersheds in which steelhead would not be released from state-operated hatcheries (Table 1).

Table 1. PSHAAC recommendations for WSGBs (HEAT 2013).

Major Population Group	Population or Watershed	Run Type	Comments
North Cascades	South Fork Nooksack	Summer	
	Samish	Winter	
	Sauk	Summer & Winter	
	Skagit	Summer & Winter	High ranking candidate by most members but not a consensus selection.
	Pilchuck	Winter	
	NF Skykomish	Summer	
	Tolt	Summer	
Central & South Puget Sound	White	Winter	Recommended when supplementation program has ended.
	Puyallup/Carbon	Winter	
	Nisqually	Winter	

Table 1. PSHAAC recommendations for WSGBs (HEAT 2013) (continued).

Major Population Group	Population or Watershed	Run Type	Comments
Hood Canal & Strait of Juan de Fuca	Skokomish	Winter	Recommended when supplementation program has ended.
	East Hood Canal	Winter	Recommended when supplementation program has ended.
	West Hood Canal	Winter	Recommended when supplementation program has ended.
	Sequim/Discovery Bay	Winter	
	Elwha	Winter	Recommended when supplementation program has ended.

WSGB Selection Guidance

The Department built upon the general WSGB strategy identified in the SSMP to develop additional guidance to inform the selection of WSGBs. Four population or watershed attributes were defined: 1) Abundant and Productive; 2) Self-Sustaining in the Future; 3) Wild Stock; and 4) Population Diversity.

The Department assessed each attribute and categorized the population as either a “Preferred”, “Adequate”, or “Poor” match with an ideal WSGB (Table 2).

Abundant and Productive. This attribute was assessed using analyses of extinction risk, the long-term change in the number of spawners, and the short-term change in the number of spawners (Appendix Table 1). The extinction risk of each population was predicted using the time trend of spawners and a population-specific quasi-extinction threshold. The quasi-extinction threshold is a number below which extinction is likely due to genetic or demographic risks. Additional information can be found in Cram and Kendall (2015).

Self-Sustaining in the Future. The Department assessed the likelihood that a population would be self-sustaining in the future by analyzing existing habitat ownership (Appendix Table 1). We assumed that federal, tribal, state, or local government ownership was likely to provide habitat protection suitable to ensure the maintenance of steelhead populations in the future. We recognize that other types of land ownership can protect and restore steelhead habitat, and used this information where available.

Wild Stock. The Department assessed the extent that the genetic characteristics of a population may have been affected by gene flow from a hatchery program (Appendix Table 1). Gene flow is the rate at which genes from a hatchery population are incorporated into a wild population. Hatchery-wild gene flow occurs when hatchery fish spawn successfully with wild fish on the spawning grounds. The greater the number of hatchery-wild hybrids produced, the

greater the gene flow. The proportion effective hatchery contribution (PEHC) is a method to estimate gene flow using genetic analysis of tissue samples. Additional information can be found in Warheit (2014) and Hoffmann (2014).

Population Diversity. The Department compiled information on the run-timing type (Summer or Winter) of each population and the hydrographic type of the associated watershed (Appendix Table 1). The hydrographic type is one attribute that can be used to assess the diversity of watersheds. The Puget Sound Technical Recovery Team (2013) classified the percentage of the watershed associated with each population that was in the following categories: Highland, Lowland, Rain Dominated, Rain/Snow Dominated, and Snow Dominated. Appendix Table 1 identifies the two most prevalent hydrographic types.

The Department recognizes that in some cases the current status of steelhead populations may require the selection of populations that do not meet the criteria for “Preferred” or “Adequate”.

Table 2. Attributes and guidance for identification of WSGBs.

Attribute	Preferred	Adequate
Abundant & Productive	Probability of extinction 10% or less in 20 years. Spawner numbers declined less than 60% since 1980.	Probability of extinction 20% or less in 20 years. Insignificant decline in spawners during last 12 years.
Self-Sustaining in the Future	Habitat Protection. More than 70% of watershed with existing habitat protection measures (e.g., national park, national forest, state forest, Habitat Conservation Plan).	Habitat Protection. More than 50% of watershed with existing habitat protection measures (e.g., national park, national forest, state forest, Habitat Conservation Plan).
Wild Stock	Proportion Effective Hatchery Contribution (PEHC) or gene flow less than 2%.	PEHC or gene flow less than 5%.
Population Diversity	Each major population group has representation of winter and summer run timing, if applicable, and a variety of hydrographic types.	Each major population group has representation of winter and summer run timing, if applicable.

WSGB Assessment

The Department assessed the attributes of all populations recommended by the PSHAAC and two additional populations (Deer and Snoqualmie). Results from the assessment are presented in Table 3.

Selection of Wild Steelhead Gene Banks

The Department will select the WSGBs after review of the public comments, assessment of the fishery and economic implications, and discussion with the tribal co-managers.

Table 3. Summary of candidate populations relative to selection guidance.

Major Population Group: North Cascades

Population	Run Type	Abundant & Productive	Self-Sustaining in the Future	Wild Stock
South Fork Nooksack	Summer	No Data	Adequate	Preferred
Samish	Winter	Preferred	Poor	Poor
Sauk	Summer & Winter	Preferred	Preferred	Adequate
Skagit	Summer & Winter		Adequate	Preferred
Deer Creek	Summer	No Data	Preferred	Preferred
Pilchuck	Winter	Preferred	Poor	Adequate
NF Skykomish	Summer	No Data	Preferred	Poor
Snoqualmie	Winter	Preferred	Adequate	Poor
Tolt	Summer	Poor	Poor	Poor

Major Population Group: Central & South Puget Sound

Population	Run Type	Abundant & Productive	Self-Sustaining in the Future	Wild Stock
White	Winter	Preferred	Adequate	Adequate ^{1/}
Puyallup/Carbon	Winter	Adequate	Poor	Adequate ^{1/}
Nisqually	Winter	Adequate	Poor	Adequate ^{1/}

Table 3. Summary of candidate populations relative to selection guidance (continued).

Major Population Group: Hood Canal & Strait of Juan de Fuca

Population	Run Type	Abundant & Productive	Self-Sustaining in the Future	Wild Stock
Skokomish	Winter	Preferred	Preferred	Adequate ^{1/}
East Hood Canal	Winter	No Data	Poor	Adequate ^{1/}
West Hood Canal	Winter	No Data	Preferred	Adequate ^{2/}
South Hood Canal	Winter	No Data	Poor	Adequate ^{2/}
Sequim/Discovery Bay	Winter	Poor	Poor	Adequate ^{1/}
Strait of Juan de Fuca Independent Tribes.	Winter	No Data	Adequate	Adequate ^{1/}
Elwha	Winter	No Data	Preferred	Adequate ^{2/}

^{1/} No estimates of gene flow available. No hatchery releases of early winter steelhead have occurred for more than 10 years.

^{2/} No estimates of gene flow available. Genetic analyses has shown that the native winter steelhead population and early-returning hatchery run have remained genetically distinct (Winans et al. 2008; Van Doornick and Berejikian 2015).

References

- Cram, J., and N. Kendall, editors. 2015. Washington State steelhead: Evaluating risk and prioritizing actions. Washington Department of Fish and Wildlife, draft report, Olympia, WA.
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- Puget Sound Technical Recovery Team (PSSTRT). 2013. Identifying historical populations of steelhead within the Puget Sound Distinct Population Segment. Final Review Draft. NOAA Fisheries, Northwest Science Center, Seattle, WA. 149pp.
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Appendix Table 1. Information on Candidate Populations
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Major Population Group: North Cascades

Population	PSHAAC Recommended	Run Type	Extinction Risk	Longterm Abundance Trend	Short Term Decline	Past Hatchery Gene Flow	% Public Land	Hydrology ^{2/}
South Fork Nooksack	Yes	Summer	-	-	-	0% (W) 0% (S)	59%	41% Rain 23% Rain & Snow
Samish	Yes	Winter	4%	+193%	No	6% (W) 0% (S)	19%	50% Lowland 41% Rain
Sauk	Yes	Summer & Winter	0%	-38%	No	4% (W) 0% (S)	94%	54% Highland 21% Snow
Skagit ^{3/}	Yes ^{1/}	Summer & Winter				2% (W) 1% (S)	61%	47% Highland 18% Snow
Deer Creek	No	Summer	-	-	-	0% (W) 2% (S)	70%	44% Snow 28% Rain & Snow
Pilchuck	Yes	Winter	6%	-47%	No	1% (W) 3% (S)	35%	56% Lowland 35% Rain
NF Skykomish	Yes	Summer	-	-	-	1% (W) 95% (S)	100%	61% Highland 27% Snow
Snoqualmie	No	Winter	0%	-55%	No	4% (W) 3% (S)	56%	28% Rain 24% Lowland
Tolt	Yes	Summer	25%	-19%	No	1% (W) 69% (S)	42%	31% Snow 31% Rain & Snow

^{1/} High ranking candidate by most members but not a consensus selection.

^{2/} Source: Puget Sound Technical Recovery Team 2013.

^{3/} Estimates of steelhead spawners are available only for the entire Skagit River watershed – not individual populations. Statistics for the Extinction Risk, Longterm Abundance Trend, and Short Term Decline are reported for the aggregate of the Skagit , Sauk, and Nookachamps populations.

Appendix Table 1. Information on Candidate Populations (continued).
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Major Population Group: Central & South Puget Sound

Population or Watershed	PSHAAC Recommended	Run Type	Extinction Risk	Longterm Abundance Trend	Short Term Decline	Past Hatchery Gene Flow	% Public Land	Hydrology ^{3/}
White	Yes ^{1/}	Winter	6%	-29%	No	^{2/}	60%	41% Highland 23% Lowland
Puyallup/Carbon	Yes	Winter	8%	-84%	No	^{2/}	30%	35% Lowland 20% Highland
Nisqually	Yes	Winter	2%	-86%	No	^{2/}	43%	47% Lowland 16% Rain & Snow

^{1/} Recommended when supplementation program has ended.

^{2/} No releases of early winter steelhead for more than 10 years.

^{3/} Source: Puget Sound Technical Recovery Team 2013.

Appendix Table 1. Information on Candidate Populations (continued).

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Major Population Group: Hood Canal & Strait of Juan de Fuca

Population or Watershed	PSHAAC Recommended	Run Type	Extinction Risk	Longterm Abundance Trend	Short Term Decline	Past Hatchery Gene Flow	% Public Land	Hydrology ^{4/}
Skokomish	Yes ^{1/}	Winter	1%	-48%	No	^{2/}	71%	40% Rain & Snow 25% Rain
East Hood Canal	Yes ^{1/}	Winter	-	-	No	^{2/}	23%	100% Lowland
West Hood Canal	Yes ^{1/}	Winter	-	-	Yes	^{2/}	76%	31% Rain & Snow 31% Lowland
South Hood Canal	No	Winter	100%	-61%	No	^{2/}	38%	92% Lowland 8% Rain
Sequim/Discovery Bay	Yes ^{1/}	Winter	79%	-74%	No	^{2/}	32%	74% Lowland 17% Rain
Strait of Juan de Fuca Independent Tribs.	No	Winter	-	-31%	No	^{2/}	58%	37% Lowland 24% Rain
Elwha	Yes ^{1/}	Winter	-	-	-	^{3/}	95%	39% Snow 36% Rain & Snow

^{1/} Recommended when supplementation program has ended.

^{2/} No releases of early winter steelhead for more than 10 years.

^{3/} No releases of early winter steelhead since 2011.

^{4/} Source: Puget Sound Technical Recovery Team 2013.